and Stengel,[1] 1899; Bennett,[2] 1900, and Webster,[3] 1903) had a twisted pedicle. Of these 8, Webster's and Bennett's cases were attended with a necrosis, though only one (Webster) mentions an adhesion. But assuming that several of the 8 reported since 1890 were complicated by adhesions or necrosis, my own case is the ninth.

My thanks are due to Dr. J. M. Newbern, of Jarvisburg, N. C., for the history of the case; to my associate and consultant, Dr. H. M. Nash, of this city; and to Drs. H. S. Baker and W. C. Campbell, of the Norfolk Protestant Hospital, for their many courtesies.

RECENT ADVANCES IN THE TECHNIQUE OF ROENTGEN-RAY THERAPY.[4]

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The great variance in the results reported in the treatment of disease by the Roentgen method must strike the reader of medical literature very forcibly and lead him to wonder if there is any truth in the favorable reports, or any logical explanation for the diversified and often apparently antagonistic physiological effects.

This feeling of doubt is readily enforced if he has chanced to come in clinical contact with the results of an inexperienced operator. It must, however, be remembered that positive evidence is always more valuable than negative. That even a few accurate observations of beneficial results attained are far weightier evidence of therapeutic efficiency than any number of failures. The time has not yet arrived when cures can be demonstrated; a longer period of therapeutic employment is necessary, though many cases have remained apparently cured for over two years. An inhibitory action has, however, been absolutely demonstrated. The power to inhibit the growth of malignant or other pathological cells has been demonstrated beyond question. This agent has been proved to be more potent than any other agent heretofore employed in checking the growth of malignant cells. Even operation, which was the most effective method of treatment, does not inhibit the growth of disease; it eradicates it by removing it from the body, but in no way alters the nature or character of the cellular growth.

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[1] American Surgery, Philadelphia, 1899, vol. xxx. p. 321.

[2] Texas Medical News, Austin, 1900-1901, vol. x. p. 703.

[3] Journal of the American Medical Association, Chicago, 1903, vol. xl. p. 887.

[4] Read before the College of Physicians of Philadelphia, February 1, 1905.

Operation is not curative except by being destructive; the Roentgen ray has been demonstrated to have inhibitory power over the cellular malignant activity of new-growths; it is reconstructive rather than destructive.

While the failures to secure permanent results far outnumber the successes, they do not outweigh them. The Roentgen method has been too frequently asked to accomplish results that were impossible by other means, and hopeless cases have been the rule rather than the exception. When it has had the opportunity to co-operate in treating cases after surgical removal of the focus of malignant disease, the results obtained in the treatment of these conditions will be improved. Roentgen treatment should supplement but never supplant operation, where operation is admissible. But to attain the highest degree of success, cases must be sent early for Roentgen treatment, as well as early for operative intervention.

The apparent variation in the effect of the Roentgen rays on disease is to be explained by differences in the technique employed by operators, and by inefficient employment resulting from inexperience and the timidity which it breeds.

The prevailing idea that this method of treatment is successful in and can only hope to influence superficial malignant growths is erroneous. The rarity of cases in which it has affected deep-seated growths has been due to lack of knowledge of the qualities of Roentgen rays suitable for their treatment and defective technique and experience in employing them. There are enough authenticated cases to demonstrate its power, and recent advances in the knowledge of technique has placed them more readily under the influence of this agent.

The facts already demonstrated make it the most potent alterative and curative agent known for the treatment of malignant disease. They make it imperative that every conscientious practitioner should carefully consider the employment of this agent as a supplementary method to surgical operation in the treatment of every case of malignant disease that comes under his care. The mortality from malignant disease even after early radical surgical removal is so great that so powerful a supplementary method of treatment ought not to be neglected.

A review of the probable physiological action and pathological changes that follow its employment will in a measure explain the rationale of its wide field of application and harmonize its apparently antagonistic effects. A study of the principles that underly its application will help to a realization of the difficulties that must be mastered by technique before accuracy and efficiency in dosage can be expected. The variation in results can then be more readily understood and can be shown to follow defective technique and not to be due to the valuelessness of the agent. It will be easy to appreciate why results can be obtained by those possessing technique and experience, while others fail even to improve similar cases.

A reasonable deduction regarding the physiological action of this agent can be gained from the clinical observation of its effects. Stimulation of nutrition, both local and systemic, has been almost universally observed where physiological effects have been produced. Changes due to altered metabolism are seen in all cases and pathological examinations have repeatedly demonstrated varying degrees of retrograde metamorphosis in tumors that have been effectively treated. This stimulant action when pushed produces decided alterative effects, which have been ascribed to the autolytic ferments within the cells and results finally in their dissolution and absorption. The effect of these forces, fortunately, is varied in its action on normal and pathological cells, a result not uncommon to stimuli. The stimulus which will injure pathological cells has no harmful effect upon normal metabolism, but rather increases the vitality and growth of normal tissues. This hypothesis readily explains the selective action of the Roentgen treatment and shows why effective dosage is difficult, since it must be strong enough to injure pathological cells and yet not too strong for normal tissues. Fortunately in practice the reaction of the skin forms a valuable clinical guide.

The clinically demonstrated physiological action of this agent, whatever it really may be, is at least unique, since it possesses the power of inhibiting the growth of malignant cells, possibly of destroying them. No other agent has ever demonstrated such power over the morbidity or the cellular energy of growth of malignant tumors. No other agent has possessed the selective power to destroy malignant cells without injuring the normal surrounding structures. The only effective method of treatment has been the removal of the diseased tissue with the surrounding normal structure or their total destruction *in situ* by cauterants. The great difference between this and all other agents employed in treating malignant disease is that it differentiates between pathological and normal tissues, retarding and preventing the development of pathological cellular activity, while it does not harm or hinder the growth of normal cells.

The latest views regarding malignant growths attribute their malignant character to an inherent and unexplained increase in the energy of growth of their cells, which experimental studies (Loeb) have shown is in marked contrast to that of the cells of normal tissues or of benign tumors. This energy varies in intensity in different tumors, but is constant for each tumor even through a long series of transplantations. Further, it has apparently been demonstrated that the formation of metastases is caused and can occur only where there is a primary increase in the energy of growth of the tumor cells.

These pathological facts harmonize with the physiological action attributed to the Roentgen energy. In their light the rationale and value of preparatory or tentative Roentgen treatment before operation and of postoperative treatment can be seen. The peculiar primary energy of growth of malignant cells is reduced by the inhibitory action of the rays. The growth not only of the original tumor but also of metastases and wandering malignant cells is checked.

It is generally conceded that an irritating or exciting cause is an essential to the development of malignant growths, and that often incomplete operations act as exciting causes and increase the morbidity of the growth. Preparatory and postoperative treatment are, therefore, valuable, because they inhibit the energy of malignant cells, if they do not destroy them, and render metastasis less liable, while the supplementary treatment destroys any remaining cells or inhibits their growth.

Can it be possible that in these pathological findings and physiological action an explanation is found for the production of malignant growths in the hands of Roentgen operators? Such cases have, unfortunately, been reported, and in them the disease originated simultaneously in both hands. Possibly the continued though feeble stimulation of normal cells resulted in a permanent increase in their energy of growth, whereby they took on the characteristics of malignant cells and acquired the power to grow and multiply at the expense of surrounding normal tissues and to form metastases.

An analogous process as diametrically opposed as is the destruction and production of malignant disease is seen in the clinical effects in hirsuties and alopecia areata, where overstimulation destroys the hair and mild stimulation causes an increased metabolism in the hair follicles and a renewed growth of hair.

But what are the difficulties that underly the accurate application and dosage of this agent? Why have the results been so varied and antagonistic? Why should they be better? And what is essential to its efficient and successful application?

The chief difficulties that underly the accurate application and dosage of this therapeutic agent lie in its method of production and the variation in its qualities, that must be recognized and applied accurately to be effective. The complicated physical apparatus employed in its production must be thoroughly understood, and special knowledge and technique acquired to produce and recognize the various qualities of this therapeutic force. In addition, clinical experience and knowledge are essential to an appreciation of their effects and the adaptation of the particular quality of energy to the lesion which it most readily affects.

Improvements in apparatus for the production and measurement of the amount of energy that is developed make these difficulties less and the acquirement of technique easier; but there will always remain the problems common to the employment of all remedies in clinical work. As has been aptly said of this agent, it must be applied in the proper quality, dose, and frequency. The most specific drugs known, quinine and mercury, cannot be successfully applied without accurate diagnosis and the help of clinical experience in dosage.

With the necessity of developing special technique to produce this therapeutic agent accurately, and again clinical technique and experience in employing it, is it to be wondered at that results have been often disheartening to those who have expected any quality and any dose to accomplish results? When, in addition, it is remembered that the majority of cases treated, especially of malignant disease, have been hopelessly inoperable, is it not a proof of the inherent value of this agent that any successes have been recorded?

The recognition of the necessity of adapting the quality and dose of this agent to each individual lesion and patient, and a clearer knowledge of which quality and technique is applicable to each group of cases, afford the prospect of greater developments and of more frequent successes in the future.

Efficient Roentgen therapy is not the result of chance, nor can it be purchased with the apparatus. The wonderful results that have been produced, though they may not be always repeated, were not due to good fortune or accident. They have followed diligent, untiring study of the phenomena observed in the Roentgen tube and their clinical effects upon disease. The necessity for special education of the clinician who would apply this agent effectively is self-evident. The knowledge of how to produce the required quality of Roentgen discharge must be combined with the knowledge of when to apply it, and clinical experience must be capable of measuring the exact dose. No therapeutic agent can be effective without the fulfilment of these requirements, and there is little wonder that without them more failures than successes have been recorded.

Such a powerful therapeutic agent is dangerous or useless in the hands of anyone less well qualified. It is dangerous if he employ it in a dose capable of doing good and is incapable of accurately observing its effects; and it is useless and even harmful if inexperience makes him timid in its employment, or ignorance leads him to employ a dose that will stimulate instead of injure pathological tissues.

But are not the poor results in deep-seated disease due to the limitations of this therapeutic agent, or why is it that so many can produce effects upon superficial lesions and cannot influence the deep-seated? There was a similar condition in the field of Roentgen diagnosis; at first lesions of bone in fingers, hands, and toes only could be diagnosed; as technique improved all parts of the body have been penetrated and the various tissues have finally yielded to a differentiation in their shadows. Those who can produce therapeutic effects on superficial lesions only will often be found as defective in making diagnoses of deep-seated lesions. Any technique and any even inefficient apparatus will effect superficial lesions just as they will make pictures, and some diagnoses in the bones of the hand and arm. The progress which has marked the development of improved technique in Roentgen diagnosis will find its counterpart in Roentgen therapeutics. The effects of varying qualities of Roentgen rays in therapeutics is now being studied as were their effects upon diagnosis. There is a more accurate application and greater efficiency already manifest. Three years ago it took twenty-eight treatments to cure an epithelioma of the eyelid which has remained cured since. A similar growth was removed apparently as effectively this winter in fourteen treatments. The result was due to an improved technique and an adaptation of the fitting quality of ray to the disease. The qualities peculiarly adapted to each variety and situation of disease are being gradually determined; many of them are already known. Advances and better results have followed and will follow each improvement in technique.

The means for measuring the amount of energy flowing through the tube have been improved, so that it is possible to compare the technique of different operators more accurately and to determine in what the effective treatment for each lesion consists.

When and how should this therapeutic agent be applied to make it most effective and of the greatest benefit to the patient?

In malignant disease it should undoubtedly be employed in conjunction with operation, not as a substitute for it, but as a component part of the treatment. Up to the advent of the Roentgen method of treatment early radical surgical removal of so much of the diseased tissues as was possible was the most efficient treatment known. That, however, cannot be as truly said now. The efficiency of the Roentgen treatment has been demonstrated to be great; it is capable of modifying the malignant nature of the cells, retarding their growth if not totally destroying them. Surgery cannot, therefore, be said to be the most efficient treatment unless it is combined with thorough postoperative Roentgen treatment.

Surgical operation and Roentgen treatment are not antagonistic, but mutually helpful and supplementary, and the patient's greatest good can be served only when they are combined. The time for applying the Roentgen rays should be either immediately after operation or just before, as a short preparatory treatment to reduce the energy of growth of the cells and destroy the outlying cells, and then again after operation.

The patient has the best chance of permanent relief from malignant disease who is brought early for operation, and that operation followed immediately by a thorough course of Roentgen treatment

The treatment must be as severe as the patient can stand, both locally and through the systemic effects, if it is to be of value.

A marked dermatitis or tanning of the skin must be produced or sufficient severity in the dose has not been employed. Autointoxication from the absorption of the dissolved malignant cells must be expected if efficient dosage has been employed where there are large growths. In cases where treatment is efficient this autointoxication will manifest itself in rheumatic pains in muscles and joints, disturbances of the stomach and liver, and a general feeling of malaise. The detection of these symptoms is an indication for the interruption of treatment for one or two weeks, as its continuance would put the patient in bed. It is, however, an indication of effective treatment. Such symptoms can, however, be produced only where there are large masses of tissue of low vitality that can be affected, as in massive recurrences or inoperable growths. It is to obviate this absorption and to hasten treatment that palliative operations can be employed in practically hopeless cases before the Roentgen rays are used. The inhibitory action, together with the ability to relieve pain where nerve trunks are not involved in the disease, makes the Roentgen rays the most potent palliative remedy known in the late stages of malignant disease.

A CASE OF UNIVERSAL CONGENITAL ATRICHIA.

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The unique case I am about to report is one of total absence of hair from all parts of the body, existing, so far as could be learned, from birth. If the history, as given by the patient, is correct, the condition cannot, strictly speaking, be regarded as one of alopecia or baldness, that is, loss of hair, but, rather, as one of atrichia, namely, failure on the part of the hair to develop. The universal distribution of the disorder is not the least remarkable feature. In addition, the nails exhibited significant changes, and there was present, besides, the rare anomaly of retinitis albicans.

The patient was a house-painter, aged sixty-four years, who was admitted to the Philadelphia General Hospital on January 2, 1904, complaining of pains throughout the body, especially in the lumbosacral region. He presented slight swelling of both lower extremities and drooping of the right upper eyelid, with inability to elevate the lid properly. The action of his heart was arrhythmic, but the sounds were clear. The especially noteworthy feature about the patient was the total absence of hair from all parts of the body, a